DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

TEST BOOKLET

Sl. No. 00213

Subject Code : 26

Subject : Statistics

LECTURERS FOR NON-GOVT. AIDED COLLEGES OF ODISHA

Time Allowed : 3 Hours

Maximum Marks : 165

: INSTRUCTIONS TO CANDIDATES :

1. **IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET CONTAINS 31 PAGES AND DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.**

2. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. **DO NOT** write anything else on the Test Booklet.

3. The Test Booklet contains **165** questions. Each question comprises four answers. You have to select the correct answer which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct answer, you should mark (darken) the answer which you consider the best. In any case choose ONLY ONE answer for each question. If more than one answer is darkened it will be considered as wrong.

4. You have to mark (darken) all your answers **ONLY** on the **separate OMR Answer Sheet** provided, by **using BLACK BALL POINT PEN**. You have to do rough work on the space provided in the Test Booklet only. See instruction in the Answer Sheet.

5. All questions carry equal marks, i.e. of one mark for each correct answer and each wrong answer will result in negative marking of **0.25** mark.

6. Before you proceed to mark (darken) in the Answer Sheet the answers to various questions in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions in your Admit Card.

7. After you have completed filling in all your answers on the Answer Sheet and after completion of the examination, you should hand over to the Invigilator the **Original Answer Sheet (OMR Answer Sheet)** issued to you. You are allowed to take with you the candidate's copy/second page of the Answer Sheet along with the Test Booklet after completion of the examination for your reference.

SEAL

Candidate's full signature

Invigilator's signature

(Turn over)

2018

1. Joint probability of Independent events J and K is equal to :

(A) P(J) * P(K)

(B) P(J) + P(K)

(C) P(J) * P(K) + P(J – K)

(D) P(J) * P(K) – P(J * K)

2. What is the marginal probability of dependent events and independent events ?

(A) One

(B) Different

(C) Same

(D) All of these

3. When we throw 2 dice then what is the probability of getting a sum 9 ?

(A) 2/9

(B) 1/9

(C) 1/12

(D) 1/3

4. Two dice are thrown simultaneously what is the probability of getting 2 numbers whose product is even ?

(A) 3/4

(B) 1/4

(C) 7/4

(D) 1/2

5. A box contains 20 electric bulbs, out of which 4 are defective. Two bulbs are chosen at random from this box. The probability, that at least one of these is defective, is :

(A) 7/19

(B) 6/19

(C) 5/19

(D) 4/19

6. A box contains 5 green, 4 yellow and 3 white balls. 3 balls are drawn at random. What is the probability that they are not of same colour ?

(A) 52/55

(B) 3/55

(C) 41/44

(D) 3/44

7. At a high school with 200 students, 32 play soccer, 18 play basket ball and 8 play both sports. If a student is selected at random, find the probability that a student plays soccer or basket ball :

(A) 71/100

(B) 1/4

(C) 4/25

(D) 1/5

8. The probability that a family visits city museum is 0.36. and the probability that a family rides on the 3 rivers ferry is 0.47. The probability that a family does both is 0.22. Find the probability that the family visits the museum or rides the ferry.

(A) 0.83

(B) 0.61

(C) 0.58

(D) 0.69

9. All values in sample distribution that can freely varies in selected random sample from population are indicated as :

(A) Degrees of freedom

(B) Degrees of error

(C) Degrees of statistic

(D) Degrees of possibility

10. You draw successive random samples of nine participants from a population, calculate the mean of each sample, and plot the sample means. If the population has a mean of 12 and a s.d of 6, the s. d of your distribution is :

(A) 4

(B) 3

(C) Can not be determined

(D) 2

11. The Central limit theorem tells us that as sample size increases the sampling distribution of the mean becomes :

(A) Less normally distributed but more leptokurtic

(B) More normally distributed with a larger range of scores

(C) More shaped like the population distribution

(D) More normally distributed with a smaller range of scores

12. At a computer manufacturing company, the actual size of computer chips is normally distributed with a mean of 1 centimeter and a s.d. of 0.1 centimeter. A random sample of 12 computer chips is taken. Above what value do 2.5% of the sample means fall ?

(A) 1.96

(B) 1.0163

(C) 1.1960

(D) 1.0566

13. The average score of all Pro-golfers for a particular course has a mean of 70 and a s. d. of 3. Suppose 36 golfers played the course today. Find the probability that the average score of the 36 golfers exceed 71 ?

(A) 0.00

(B) 0.3694

(C) 0.0228

(D) Information Insufficient

14. A Basket ball player makes 80% of his free throws during the season. What is the probability that he will make exactly 6 of his next 8 free throws ?

(A) 0.1468

(B) 0.3355

(C) 0.1678

(D) 0.2936

15. Given x = 2 and f(x) = 0.5. If y = 2x – 3, then f(y) is equal to :

(A) 1

(B) 0.5

(C) – 2

(D) 0

16. If Var(x) 5 = and V(y) = 10, then v(2x + y) is :

(A) 15

(B) 20

(C) 10

(D) 30

17. The distribution function F(x) is equal to :

(A) $P(X = x)$

(B) $P(X \leq x)$

(C) $P(X \geq x)$

(D) All of these

18. What would be the probability of an event 'G'. If H denotes its complement, according to the axioms of probability ?

(A) $P(G) = 1/P(H)$

(B) $P(G) = 1 - P(H)$

(C) $P(G) = 1 + P(H)$

(D) $P(G) = P(H)$

19. If A and B are 2 events then the probability of exactly one of them occurs is given by :

(A) $P(A \cap \bar{B}) + P(\bar{A} \cap B)$

(B) $P(A) + P(B) - 2P(A)\,P(B)$

(C) $P(\bar{A}) + P(\bar{B}) - 2P(\bar{A})\,P(\bar{B})$

(D) $P(A) + P(B) - P(A \cap B)$

20. A survey determines that in a locality, 33% go to work by bike, 42% go by car, and 12% use both. The probability that a random person selected uses neither of them is :

(A) 0.29

(B) 0.37

(C) 0.61

(D) 0.75

21. Husband and wife apply for 2 vacant spots in a Company. If the probability of wife getting selected and husband getting selected are 3/7 and 2/3 respectively. What is the probability that neither of them will be selected ?

(A) 2 / 7

(B) 5 / 7

(C) 4 / 21

(D) 17 / 21

22. An Urn B_1 contains 2 white and 3 black chips and another Urn B_2 contains 3 white and 4 black chips. One Urn is selected at random and a chip is drawn from it, if the chip drawn is found black, find the probability that the Urn chosen was B_1 :

(A) 4 / 7

(B) 3 / 7

(C) 20 / 41

(D) 21 / 41

23. At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3 :2 in favour of women. If a student is selected at random from among all those over 6 feet tall, what is the probability that the student is a women ?

(A) 2/5

(B) 3/5

(C) 3/11

(D) 1/100

24. What does the law of large numbers mean ?

(A) The more you try, the more likely you are to get what you want

(B) No matter how many times you try, the probability remains the same

(C) Trying harder is a good idea

(D) Running for a long time

25. If you are spinning a colour wheel with seven colours on it and you have 100 spins to get a red. After 99 spins you have gotten every color but red. What is the chance you will spin a red on the 100^{th} spin ?

(A) 1

(B) 1 / 100

(C) 6 / 7

(D) 1 / 7

26. If you are stranded on a desert and you can't get off until you roll a six on a die, how many rolls will you ask for ?

(A) 6

(B) 1

(C) 23

(D) Infinite

27. What would be the joint probability of statistically independent events that occur simultaneously ?

(A) Zero

(B) Not equal to zero

(C) Infinite

(D) Consistent

28. The conditional distribution of y given X = x, P(Y = y/X = x) is :

(A) $\frac{P(Y = y)}{P(X = x)}$

(B) $\sum_{i=1}^{\ell} P(X = x_i, Y = y)$

(C) $\frac{P(X = x, Y = y)}{P(Y = y)}$

(D) $\frac{P(X = x, Y = y)}{P(X = x)}$

29. The conditional expectation of Y given X, E(Y/X = x) is calculated as follows :

(A) $\sum_{i=1}^{k} y_i P(X = x_i / Y = y)$

(B) E{E(Y/X)}

(C) $\sum_{i=1}^{k} y_i P(Y = y_i / X = x)$

(D) $\sum_{i=1}^{\ell} E(Y / X = x_i) P(X = x_i)$

30. Two random variables X and Y are independently distributed if all of the following conditions hold with the exception of :

(A) $P(Y = y / X = x) = P(Y = y)$

(B) $E(Y) = E[E(Y/X)]$

(C) Knowing the value of one of the variables provides no information about the other

(D) If the conditional distribution of Y/X equals to the marginal distribution of Y

31. If the Joint p. d. f. of two random variables X and Y is defined as :

$$f(x, y) = \begin{matrix} x+y & \text{for } 0 \le x \quad y \le 1 \\ 0; & \text{otherwise} \end{matrix}$$

then the marginal distribution of X is :

(A) $f_X(x) = x + 1/4$

(B) $f_X(x) = (x + y + 1)$

(C) $f_X(x) = x + 1/2$

(D) $f_X(x) = x + \frac{3}{16}$

32. The relations of cumulative distribution function with J. p. d. f, f(x, y) of 2 dimensional random variables X and Y is :

(A) $F(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(x,y)dxdy$

(B) $F(x, y) = \int_{0}^{\infty} \int_{0}^{\infty} f(x,y)dxdy$

(C) $F(x, y) = \int_{-\infty}^{x} \int_{-\infty}^{x} f(x,y)dx\,dy$

(D) $F(x, y) = \int_{-\infty}^{x} \int_{-\infty}^{y} f(x,y)dx\,dy$

33. The (1, 1)th central moment for the joint p. d. f. $f(x, y) = 3 - x - y$ for $0 \le x, y \le 1$ is :

(A) $\mu_{1,1} = -1/4$

(B) $\mu_{1,1} = 1/12$

(C) $\mu_{1,1} = 0$

(D) $\mu_{1,1} = \frac{1}{24}$

34. A man rolls a fair die again and again until he obtains a 5 or 6. Calculate the probability that he will require 5 throws :

(A) 16/243

(B) 15/243

(C) 16/242

(D) 15/240

35. A marker is to continue shooting at the target until he hits the target 6 times. The probability that he hits the target on any shooting is 0.4. What is the probability that the marker will have to shoot 9 times ?

(A) 0.0593

(B) 0.0495

(C) 0.0415

(D) 0.0413

36. If a Poisson variate X is such that $P(x = 1) = P(x = 2)$, what is $P(x = 4)$ {given $e^{-2} = 0.1353$} :

(A) 0.08

(B) 0.082

(C) 0.085

(D) 0.09

37. The chances of a Bomber hitting the target and missing the target are 3 : 2. Calculate the probability that the target will be hit at least once in five sorties :

(A) $\frac{3093}{3125}$

(B) $\frac{3095}{3125}$

(C) $\frac{3098}{3125}$

(D) $\frac{3093}{3175}$

38. It has been found that as an average the number of mistakes per typed page of a typist is 1.5. Find the probability that there are 3 or less mistakes (given $e^{-1.5} = 0.2231$) :

(A) 0.9333

(B) 0.9342

(C) 0.9313

(D) 0.9383

39. Cauchy Schwartz inequality states that if X and Y are two random variables taking real values then :

(A) $E[(XY)^2] \leq E(X^2)\, E(Y^2)$

(B) $E[(XY)^2] \leq E(X)\, E(Y)$

(C) $E[(XY)^3] \leq E(X^2)\, E(Y^2)$

(D) $E[(XY)^2] \geq E(X) \,.\, E(Y)$

40. A machine produces 10% defective items. Ten items are selected at random. Find the probability of not more than two items being defective :

(A) $\left(\frac{24}{9}\right)\left(\frac{9}{10}\right)^8$

(B) $\frac{24}{9}\left(\frac{9}{10}\right)^5$

(C) $\frac{24}{9}\left(\frac{9}{10}\right)^9$

(D) $\frac{24}{9}\left(\frac{9}{10}\right)^{10}$

41. If an International film festival, a panel of 11 judges was formed to judge the best film. At last two films F_A and F_B were considered to be the best where the opinion of Judges got divided. Six judges were in favour of F_A where as five in favour of F_B. A random sample of 5 judges was drawn from the panel. Find the probability that out of 5 judges, there were in favour of flim F_A :

(A) $\frac{100}{230}$

(B) $\frac{100}{235}$

(C) $\frac{100}{231}$

(D) $\frac{100}{229}$

42. If $f(x) = C * \exp\{-(x^2 - 6x + 9)\}/32$; $-\infty < x < \infty$, represents a normal distribution, what is value of 'C', mean and variance of distribution ?

(A) $C = \frac{1}{4\sqrt{2\pi}}$; Mean = 3; Variance = 4

(B) $C = \frac{1}{2\sqrt{2\pi}}$; Mean = 3.5; Variance = 2

(C) $C = \frac{1}{3\sqrt{2\pi}}$; Mean = 4; Variance = 4

(D) $C = \frac{1}{2\sqrt{2\pi}}$; Mean = 2.5; Variance = 2

43. If x has a Rectangular distribution $f(x) = \frac{1}{4}$; $-2 \le x \le 2$, then p. d. f. g(y) of a variable $y = \sin x$ is :

(A) $\frac{1}{4\sqrt{1-y^2}}$

(B) $\frac{1}{4(1-y^2)}$

(C) $\frac{1}{4(1-y)}$

(D) $\frac{1}{4(1-y)^2}$

44. If $x \sim$ Exponential (λ), variance $y = e^{-\lambda x}$ has what distribution ?

(A) U(0, 1)

(B) N(0, 1)

(C) Gamma distribution

(D) Beta distribution

45. If a variable X has the p. d. f. $f(x) = \frac{1}{4}x \exp(-x/2)$ for $0 \leq x < \infty$, then the distribution has mean and variance as :

(A) Mean = 2; Variance = 4

(B) Mean = 1/2; Variance = 1/ 4

(C) Mean = 4; Variance = 8

(D) Mean = 4; Variance = 2

46. If the m. g. f. of a random variable X is $\{\frac{1}{3} + \frac{2}{3} \exp(t)\}$then X is a :

(A) Negative Binomial Variate

(B) Binomial Variate

(C) Bernoulli Variate

(D) Poisson Variate

47. Let X be a r.v. U(0, 1) then the variate $y = -2 \log X$ follows :

(A) Chi-square distribution

(B) Log normal distribution

(C) Gamma distribution

(D) Exponential distribution

48. If a distribution has m. g. f. $M_X(t) = (2 - e^t)^{-3}$, then the distribution is :

(A) Geometric distribution

(B) Hyper-geometric distribution

(C) Binomial distribution

(D) Negative Binomial distribution

49. The m. g. f. of a random variable X is,

$$M_X(t) = \frac{2}{5} + \frac{1}{3} \exp(2t) + \frac{4}{15} \exp(3t).$$

The expected value of X is :

(A) 22/15

(B) 9/5

(C) 17/15

(D) 11/5

50. If a continuous r. v. X has p. d. f.

$$f(x) = \frac{1}{3}; \quad -1 \leq x \leq 0$$

$$= \frac{2}{3}; \quad 0 \leq x \leq 1$$

then $E(X^2)$ is equal to :

(A) 1/9

(B) 2/3

(C) 5/12

(D) 1/3

51. A Poisson r. v. has $\mu_4 = 2$ the value of its mean is :

(A) 1/3

(B) 1/4

(C) 2/3

(D) 3/4

52. The skewness of a Binomial distribution will be zero if :

(A) $p < 1/2$

(B) $p > 1/2$

(C) $p = 1/2$

(D) $p < q$

53. The characteristic function of a distribution is given as $\exp(i\mu t)\left\{1+\frac{t^2}{\lambda^2}\right\}^{-1}$ by identicality, the distribution for which it stands is :

(A) Double exponential

(B) Poisson distribution

(C) Cauchy distribution

(D) Exponential distribution

54. Let X_1 and X_2 be 2 independent random variables having the same geometric distribution. Then the conditional distribution of $X_1 / X_1 + X_2$ is :

(A) Geometric distribution

(B) Poisson distribution

(C) Cauchy distribution

(D) Uniform distribution

55. A hyper geometric distribution has :

(A) Two parameters

(B) Three parameters

(C) One parameter

(D) (n – k) parameters

56. The commulative distribution function of a gamma variate is known as :

(A) Gamma function

(B) Complete Gamma function

(C) Inconsistent Gamma function

(D) Incomplete Gamma function

57. Let X be a random variable having probability density funtion $f(x) = \frac{1}{\pi} * \frac{1}{1+x^2}$ then :

(A) $E|X|$ is finite and Median does not exist

(B) $E|X|$ is finite and Median is taken at $x = 0$

(C) $E|X|$ is not finite and Median is taken at $x = 0$

(D) $E|X|$ is not finite and Median does not exist

58. Let $X_1, X_2 \ldots X_n$ be independent variables having exponential distribution with parameters $\theta_1, \theta_2 \ldots \theta_n$ respectively, then $z = \text{Min}(X_1, X_2 \ldots X_n)$ has exponential distribution with parameter :

(A) $\sum_i \theta_i$

(B) $\sum_i \theta_i / n$

(C) $\text{Min}(\theta_1, \theta_2 \cdots \theta_n)$

(D) $\sum_i \theta_i^2 / n$

59. A relationship similar to that between Binomial and Geometric distributions exists between :

(A) Poisson and Exponential

(B) Poisson and Gamma

(C) Poisson and Geometric

(D) Poisson and Beta

60. If X has a geometric distribution then for any two positive integers m and n, $p(X > m + n/X > n) =$:

(A) $P(X \geq m)$

(B) $P(X \leq m)$

(C) $P(X \geq n)$

(D) $P(X \leq n)$

61. Which one of the following probability distributions precisely computes the probability that there are 'x' failures preceeding the r^{th} success in (x + r) trials ?

(A) Binomial

(B) Poisson

(C) Negative Binomial

(D) Hypergeometric

62. If a variate $X \sim \beta_1(m, n)$, where m, $n > 1$, the mode lies at the point :

(A) $\frac{(m-1)}{(m+n-2)}$

(B) $\frac{(m-1)}{(m+n-1)}$

(C) $\frac{m}{m+n-2}$

(D) $\frac{m}{m+n}$

63. Pearson's coefficient of skewness for the negative Binomial distribution $\binom{-r}{x} p^r (-q)^X$ is:

(A) $\frac{(p+q)^2}{rpq}$

(B) $\frac{p}{rq}$

(C) $\frac{(P+Q)^2}{PQ}$

(D) $\frac{(P+Q)^2}{rPQ}$

{here $p = \frac{1}{Q} : q = \frac{P}{Q}$}

64. If a variate $X \sim \gamma(\alpha, 1)$, the p. d. f. of X is same as that of :

(A) Chi-square distribution

(B) Exponential distribution

(C) Normal distribution

(D) Weibull distribution

65. A normal random variable has mean = 2 and variance = 4. Its fourth Central Moment μ_4 will be :

(A) 16

(B) 64

(C) 80

(D) 48

66. If a discrete random variable takes on four values – 1, 0, 3, 4 with probabilities 1/6, K, 1/4 and 1 – 6 K, where K is a constant, then the value of K is :

(A) 1/3

(B) 2/9

(C) 1/12

(D) 5/24

67. Which one of the following scales is the best scale of measurement ?

(A) Nominal scale

(B) Ordinal scale

(C) Interval scale

(D) Ratio scale

68. Which scale uses the concept of absolute zero ?

(A) Ratio scale

(B) Nominal scale

(C) Ordinal scale

(D) Interval scale

69. Discrete variables and continuous variables are 2 types of :

(A) Open end classification

(B) Time series classification

(C) Qualitative classification

(D) Quantitative classification

70. In stem and leaf display diagrams used in exploratory analysis, stems are considered as :

(A) Central digits

(B) Trailing digits

(C) Leading digits

(D) Dispersed digits

71. Classification method in which upper limit of intervals is same as of lower limit class interval is called :

(A) Exclusive method

(B) Inclusive method

(C) Mid-point method

(D) Ratio method

72. A die is thrown 1000 times and the outcomes were recorded as follows :

Out come	Frequency
1	180
2	150
3	160
4	170
5	150
6	190

If the die is thrown once more, then the probability that it show 5 is :

(A) 9/50

(B) 3/20

(C) 4/25

(D) 7/25

73. What is the difference between interval/ratio and ordinal variables ?

(A) The distance between categories is equal across the range of interval/ratio data

(B) Ordinal data can be rannk ordered, but interval/ratio data cannot

(C) Internal/Ratio variables contain only 2 categories

(D) Ordinal variables have a fixed zero point, whereas intervals ratio variables do not

74. What is difference between a Bar Chart and a Histogram ?

(A) Bar charts represent numbers, whereas histograms represent percentages

(B) A histogram does not show the entire range of scores in a distribution

(C) There are no gaps between the bars on a histogram

(D) Bar charts are circular, whereas histograms are square

75. What is the function of a contingency table, in the content of bivariate Analysis ?

(A) It shows the results you would expect to find by chance

(B) It summarises the frequencies of 2 variables so that they can be computed

(C) It list the different levels of p value for tests of significance

(D) It compares the results you might get from various statistical tests

76. What is the name of the test that is used to assess the relationship between two ordinal variables ?

(A) Spearman's rho

(B) Cramer's v

(C) Chi-square

(D) t-statistic

77. What is meant by a "spurious" relationship between two variables ?

(A) One that is so ridiculously illogical it cannot possibly be true

(B) An apparent relationship that is so curious it demands further attention

(C) A relationship that appears to be true because each variable is related to a third one

(D) One that produces a perfect negative correlation on a scatter diagram

78. If mean is 25 and s.d. is 5 then coefficient of variation is :

(A) 100%

(B) 25%

(C) 20%

(D) 50%

79. The Coefficient of skewness is always zero for a :

(A) Symmetrical distribution

(B) Skewed distribution

(C) Negatively skewed distribution

(D) Positively skewed distribution

80. The degree of peakedness is called :

(A) Dispersion

(B) Skewness

(C) Symmetry

(D) Kurtosis

81. Quartile coefficient of skewness lies between :

(A) – 1 and 0

(B) 0 and 1

(C) – 1 and +1

(D) 0 and ∞

82. For Mesokurtic curve of the distribution, β_2 is :

(A) < 3

(B) Zero

(C) 3

(D) > 3

83. In uni model distribution, if mode is less than mean :

(A) Negatively skewed

(B) Positively skewed

(C) Normal

(D) Symmetrical

84. In Mesokurtic distribution :

(A) $\mu_4 > 3\sigma^2$

(B) $\mu_4 \neq 3\sigma^2$

(C) $\mu_4 < 3\sigma^2$

(D) $\mu_4 = 3\sigma^2$

85. Let the coefficient of determination computed to be 0.39 in a problem involving one independent variable and one dependent variable. This result means that :

(A) The relationship between two variables is negative

(B) The correlation coefficient is 0.39 also

(C) 39% of the total variation is explained by the Independent variable

(D) 39% of the total variation is explained by the dependent variable

86. For which Regression assumption does the Durbin Watson-Statistic Test ?

(A) Linearity

(B) Homoscedasticity

(C) Multicollinearity

(D) Independence of Errors

87. What is b_0 in Regression analysis ?

(A) The value of the outcome when all of the predictors are zero

(B) The relationship between a predictor and the outcome variable

(C) The value of the predictor variable when the outcome is zero

(D) The gradient of the regression line

88. Homogeneity of 3 or more population correlation coefficients can be tested by :

(A) t-test

(B) z test

(C) χ^2 test

(D) F-test

89. If there are K groups and each group consists on 'n' observation, the limits of intra – class correlation are :

(A) 0 to 1

(B) $\frac{1}{n-1}$ to 1

(C) $-\frac{1}{n-1}$ to 1

(D) – 1 to 1

90. The formula for multiple correlation coefficient $R_{2.13}$ in terms of simple correlation coefficients γ_{12}, γ_{13} and γ_{23} is :

(A) $\dfrac{\gamma_{12}^2 + \gamma_{23}^2 - 2\gamma_{12}\gamma_{23}\gamma_{13}}{(1-\gamma_{13}^2)}$

(B) $\sqrt{\dfrac{\gamma_{12}^2 + \gamma_{23}^2 - 2\gamma_{12}^2\gamma_{13}^2\gamma_{23}^2}{(1-\gamma_{13}^2)}}$

(C) $\sqrt{\dfrac{\gamma_{12}^2 + \gamma_{23}^2 - 2\gamma_{12}\,\gamma_{13}\,\gamma_{23}}{1-\gamma_{23}^2}}$

(D) $\sqrt{\dfrac{\gamma_{12}^2 + \gamma_{23}^2 - 2\gamma_{12}\,\gamma_{23}\,\gamma_{13}}{(1-\gamma_{13}^2}}$

91. If X_1, X_2 and X_3 are 3 variables, the partial correlation between X_2 and X_3 eliminating the effect X_1 in terms of simple correlation coefficients is given by the formula :

(A) $\gamma_{23.1} = \dfrac{\gamma_{23} - \gamma_{12}\gamma_{13}}{\sqrt{(1-\gamma_{12}^2)(1-\gamma_{13}^2)}}$

(B) $\gamma_{23.1} = \dfrac{\gamma_{32} - \gamma_{21}\gamma_{31}}{\sqrt{(1-\gamma_{21}^2)(1-\gamma_{31}^2)}}$

(C) $\gamma_{23.1} = \dfrac{\gamma_{32} - \gamma_{12}\,\gamma_{13}}{\sqrt{(1-\gamma_{12}^2)(1-\gamma_{13}^2)}}$

(D) All of these

92. If the two lines of Regression are $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ means of x and y are :

(A) $\bar{x} = -3, \bar{y} = 4$

(B) $\bar{x} = 2, \bar{y} = 4$

(C) $\bar{x} = 1, \bar{y} = 2$

(D) $\bar{x} = 0, \bar{y} = 5$

93. If the two lines of Regressions are $X = \dfrac{-1}{18} Y + l$; $Y = -2X + m$, the values of ℓ and m are :

(A) $\ell = 8/9$; $m = -5$

(B) $\ell = 8/9$; $m = -3$

(C) $\ell = -10/9$; $m = -4$

(D) $\ell = -8/9$; $m = 0$

94. The partial correlation coefficient $\gamma_{12.34}$ is called :

(A) Zero order partial correlation

(B) First order partial correlation

(C) Second order partial correlation

(D) Third order partial correlation

95. Which of the following relation is correct ?

(A) $\gamma_{12.34} = \gamma_{13.24}$

(B) $\gamma_{12.3} = \gamma_{21.3}$

(C) $\gamma_{13} = \gamma_{23}$

(D) $\gamma_{12.3} = \gamma_{13.2}$

96. Let the equation of the regression lines be expressed as $2X - 3Y = 0$ and $4Y - 5X = 8$. Then the correlation between X and Y is :

(A) $\sqrt{15/8}$

(B) $\sqrt{8/15}$

(C) $\sqrt{6/15}$

(D) $\sqrt{1/15}$

97. The multiple correlation coefficient $R_{1.23}$ as compared to any simple correlation coefficients between the variables X_1, X_2 and X_3 is :

(A) Less than any γ_{12}, γ_{13}, γ_{23}

(B) Not less than any γ_{12}, γ_{13} and γ_{23}

(C) Always equal to the sum of γ_{12}, γ_{13}, γ_{23}

(D) Always equal to the product of γ_{12}, γ_{13}, γ_{23}

98. If the sum of squares of the differences between the Ranks of two series is 33, then the rank correlation coefficient is :

(A) 0.967

(B) 0.725

(C) 0.80

(D) 0.67

99. If for 2 attributes A and B, $AB > \frac{(A)(B)}{N}$ the attributes are :

(A) Independent

(B) Positivley associated

(C) Negatively associated

(D) Attribute A > Attribute B

100. Range or set of values which have chances to contain value of population parameter with particular confidence level is considered as :

(A) Secondary Interval Estimation

(B) Confidence Interval Estimate

(C) Population Interval Estimate

(D) Sample Interval Estimate

101. For a parameter whose value is unknown, belief or claim for that parameter is classified as :

(A) Parameter claiming testing

(B) Expected belief testing

(C) Hypothesis testing

(D) Primary limit testing

102. To develop Interval estimate of any parameter of population, value which is added or substracted from point estimate is classified as :

(A) Margin of efficiency

(B) Margin of error

(C) Margin of consistency

(D) Margin of biasedness

103. Considering sample size, sampling distribution standard error decreases when the :

(A) Size of sample decreases

(B) Margin of error increases

(C) Margin of error decreases

(D) Size of sample increases

104. The main disadvantage of maximum likelihood methods is that they are :

(A) Mathematically less folded

(B) Mathematically less complex

(C) Computationally lucid

(D) Computationally intense

105. Which of the following is a **wrong** statement about the maximum likelihood approach ?

(A) This method doesnot involve probability calculation

(B) It finds a tree that best accounts for the valuation in a set of sequences

(C) The method is similarly to the maximum parsimony method

(D) The analysis is perfomed on each column of a multiple sequence alignment

106. Mean squared error of an estimator T_n of $\tau(\theta)$ is Minimum only if :

(A) Bias and $V_\theta(T_n)$ both are zero

(B) Bias is zero and $V_\theta(T_n)$ is minimum

(C) Bias is minimum and $V_\theta(T_n)$ is zero

(D) Bias is not zero $V_\theta(T_n)$ is maximum

107. If T_n and T_n^* are 2 u. b. e of $\tau(\theta)$ based on the random sample $X_1, X_2 .... X_n$, then T_n is said to be UMVUE if and only if :

(A) $V(T_n) \geq V(T_n^*)$

(B) $V(T_n) \leq V(T_n^*)$

(C) $V(T_n) = V(T_n^*)$

(D) $V(T_n = V(T_n^*) = 1$

108. The denominator in the Cramer Rao Inequality is known as :

(A) Information limit

(B) Lower bound of the variance

(C) Upper bound of the variance

(D) Both lower and upper bounds with infinite

109. Efficiency of sample mean as compared to median as an estimate of the mean of a normal population is :

(A) 64 percent

(B) 157 percent

(C) 317 percent

(D) 315 percent

110. If $X_1, X_2 .... X_n$ is a random sample from the population having the density function $f(x, \theta) = \frac{1}{\sqrt{2\pi\theta}} e^{-\frac{1}{2}x^2/\theta}$ then the maximum likelihood estimator for θ is :

(A) $\sqrt{\sum X_i^2 / n}$

(B) $\sum X_i^2 / n$

(C) $\sqrt{\sum X_i / n}$

(D) $\sum X_i^2 / \sqrt{n}$

111. A family receives 1, 2 and 3 wrong telephone calls on 3 randomly selected days. Assuming that the wrong calls follow Poisson distribution, the estimate of the number of wrong calls in 6 days is :

(A) 6

(B) 12

(C) 36

(D) 48

112. A random sample of 16 houses has an average body weight 52 kgs and s.d. of 3.6 kg. 99% central confidence limits for body weight in general are {Given $t_{150.01} = 2.95$} :

(A) (54.66; 49.345)

(B) (52.66; 51.34)

(C) (52.28; 48.72)

(D) (50.28; 43.72)

113. Least square estimators under linear set up are :

(A) Unbiased

(B) UMVUE's

(C) BLUE's

(D) All of these

114. The M. L. estimators are necessarily :

(A) Unbiased

(B) Sufficient

(C) Most efficient

(D) Unique

115. A confidence internal of confidence coefficient $(1 - \alpha)$ is the best which has :

(A) Smallest width

(B) Vastest width

(C) Upper and lower limits equidistant from the parameter

(D) One side confidence interval

116. For a Random sample from a Poisson population $P(\lambda)$, the maximum likelihood estimate of λ is :

(A) Median

(B) Mode

(C) Geometric mean

(D) Mean

117. For an estimator to be consistent, the unbiasedness of the estimate is :

(A) Necessary

(B) Sufficient

(C) Necessary as well as sufficient

(D) Neither necessary nor sufficient

118. Formula for Statistic-Chi-square for the Binomial frequencies a and b to occur in a specified ratio r : 1 is :

(A) $\frac{r(a-b)^2}{r(a+b)}$

(B) $\frac{(a-rb)^2}{r(a+b)}$

(C) $\frac{(a-rb)^2}{r(a+b)^2}$

(D) $\frac{(ar-b)^2}{r(a+b)}$

119. A normal population has a mean of 0.5 and s. d. = 6. The probability that the sample mean of 625 items of a sample will be negative is :

(A) 0.0188

(B) 0.365

(C) 0.4812

(D) 0.135

120. Given the following sample of 8 observations, $-4, -3, -3, 0, 3, 3, 4, 4$ the value of students t-test $H_0 : \mu = 0$ is :

(A) 2.73

(B) 0.97

(C) 3.3

(D) 0.41

121. For testing $H_0 : \sigma = \sigma_0$ in a normal population $N(0, \sigma^2)$, a Critical Region based on sample $X_1, X_2 \ldots X_n$ is $\sum X_i^2 < K$. For which alternative hypothesis does this provide uniformly most powerful test :

(A) $\sigma \neq \sigma_0$

(B) $\sigma^2 = \sigma_0^2$

(C) $\sigma < \sigma_0$

(D) $\sigma > \sigma_0$

122. The claimed average life of electric bulbs is 2000hrs with a s.d. equals to 250 hrs. To make 95% sure that the bulbs should not fall below the claimed average life by more than 5%, the sample size should be :

(A) 24

(B) 16

(C) 41

(D) 38

123. The _____ can be defined as the sequence of identical occurrence of the elements (numbers of symbols). preceded or followed by different occurrence of the elements or by no elements at all :

(A) Mann-Whitney 'U' test

(B) Kruskal Wallis test

(C) Friedman Test

(D) Runs test

124. You have conducted a study comparing Army, Navy and RAF cadets as a measure of leadership skills. There are unequal group sizes and the data is skewed so you need to use a NP-test. Which test you choose ?

(A) Wilcoxon

(B) Friedman

(C) Mann Whitney

(D) Kruskal Wallis

125. The null hypothesis of the sign test is that :

(A) Half the ranks to be less than median and half greater than median

(B) Half the ranks to be less than mean and half greater than the mean

(C) The lower half the ranks to have the same mean as the upper half

(D) The lower half the ranks to have the same s. d. of the upper half

126. The null hypothesis for the Mann-Whitney U-test is used to test that :

(A) Two samples are from different populations

(B) Two samples are from different populations but have the same mean

(C) Two samples are from the same populations and have the same mean

(D) Two samples are from the same population and have the same median

127. What would be the ideal test for a single large enough sample with categorical data ?

(A) Chi-square test

(B) Fishers exact test

(C) ANOVA

(D) One sample t-test

128. If the sample size in Wald-Wolfwitz runs test is large, the variate R is distributed with mean :

(A) $\frac{2m}{m+n}+1$

(B) $\frac{2n}{m+n}+1$

(C) $\frac{2mn}{m+n}$

(D) $\frac{2mn}{m+n}+1$

129. While performing Kruskal-Wallis test the Ranks are assigned :

(A) Independendently to the observation for each treatment

(B) For observations in each block independently

(C) By pooling all the observations

(D) Independently taking the observations deviations

130. If there are 3 items and number of Judges is two, then the probabilities of occurrence of the value of γ_s as $-1, -\frac{1}{2}, \frac{1}{2}, 1$ are respectively :

(A) $\frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}$

(B) $\frac{1}{6}, \frac{1}{3}, \frac{1}{3}, \frac{1}{6}$

(C) $\frac{-1}{6}, -\frac{1}{3}, \frac{1}{3}, \frac{1}{6}$

(D) $\frac{1}{4}, \frac{1}{6}, \frac{1}{3}, \frac{1}{3}$

131. In NP-statistic, usually the confidence interval is found out for :

(A) Population Medium

(B) Population Mean

(C) Both (A) and (B)

(D) Neither (A) nor (B)

132. Kruskal Wallis H statistic with K treatments and n blocks which is approximated to Chi-square has d.f :

(A) $(n-1)$

(B) $(K-1)(n-1)$

(C) $(K-1)$

(D) $K(n-1)$

133. A sample consists of :

(A) All units of the population

(B) Any fraction of the population

(C) 50% units of the population

(D) 5% units of the population

134. When an Investigator wants a sample containing 'm' units which posses a rare attribute, the appropriate sampling procedure is :

(A) SRSWOR

(B) Stratified sampling

(C) Inverse sampling

(D) SRSWR

135. The most important factor in determining the size of a sample is :

(A) The availability of resources

(B) Purpose of survey

(C) Heterogeneity of population

(D) Complete enumeration

136. If 'n' units are selected in a sample from N population units, the sampling fraction is given as :

(A) N/n

(B) 1/N

(C) 1/n

(D) n/N

137. Stratified sampling comes under the category of :

(A) Restricted sampling

(B) Subjective sampling

(C) Purposive sampling

(D) Unrestricted sampling

138. Which one problem out of the four is **not** related to stratified sampling ?

(A) Fixing the criterion for stratification

(B) Fixing the number of strata

(C) Fixing the sample size

(D) Fixing the points of demarcation between strata

139. In sampling without replacement the standard error of sampling distribution of sample proportion $\hat{p}$ is equal to :

(A) $pq\left(\frac{N-n}{N-1}\right)$

(B) $\frac{pq}{n}\left(\frac{N-n}{N-1}\right)$

(C) $\sqrt{\frac{pq}{n}\frac{(N-n)}{N-1}}$

(D) $\frac{\sqrt{pq}}{n}\left(\frac{N-n}{N-1}\right)$

140. In systematic sampling, value of K is classified as :

(A) Sampling Interval

(B) Sub-stage Interval

(C) Secondary stage Interval

(D) Multi-stage Interval

141. Mistakes of biases are considered as causes of non-sampling errors must includes :

(A) Incorrect enumeration of population

(B) Non-Random sample selection

(C) Incomplete questionnaire

(D) All of these

142. A sample of 16 items from an inifinte population having s. d. = 4 yielded total scores as 160. The S. E. of sampling distribution of mean is :

(A) 1

(B) 10

(C) 40

(D) 45

143. A population of N units is divided into 'K' strata. A sample of size 'n' is to be selected. Let N_J the J^{th} stratum size and n_J, the sample size from it (J = 1, 2 ···· K). Then formula for selection of n_J under proportional allocation is :

(A) $n_J = \frac{N}{n}$

(B) $n_J = \frac{N}{N_J}$

(C) $\frac{n_J}{N_J} = \frac{n}{N}$

(D) $n_J N_J = Nn$

144. Ratio estimator is better estimate of $\bar{Y}$ than sample mean based on SRSWOR if :

(A) $MSE(\hat{\bar{Y}}_R) < Var_{SRS}(\bar{y})$

(B) $MSE(\hat{\bar{Y}}_R) > Var_{SRS}(\bar{y})$

(C) $MSE(\hat{\bar{Y}}_R) \neq Var(\bar{y})$

(D) $\frac{MSE\left(\hat{\bar{Y}}_R\right)}{Var(\bar{y})}$

145. The ratio estimate $\hat{\bar{Y}}_R$ is the best linear use of $\bar{Y}$ when, the relation between y_i and x_i is :

(A) $y_i = \beta x_i$

(B) $y_i = \beta x_i + e_i$

(C) $y_i = \beta^{xi} + e_i$

(D) $\frac{y_i}{\beta x_i + e_i}$

146. A market researcher randomly selects 500 people from each of 10 cities :

(A) Simple Random

(B) Systematic sampling

(C) Stratified sampling

(D) Convenience sampling

147. Replication in an experiment means :

(A) The number of Blocks

(B) Total number of treatments

(C) Total number of times a treatment occurs in an experiment

(D) Fraction to be sampled

148. The formula for determining the number of replications 'r' with uaual notation is :

(A) $r = 2t_{\alpha}^2 s^2/d^2$

(B) $r = \sqrt{2}\ t_{\alpha} s^2/d^2$

(C) $r = t_{\alpha}^2 s^2/d^2$

(D) $r = 2t_{\alpha} s/d$

149. In case of a random effect model, the hypothesis which is to be tested with regarded to the treatments is :

(A) $\tau_i = 0$

(B) $\Sigma\tau_i^2 = 0$

(C) $\Sigma\tau_i = 0$

(D) $\sigma_t^2 = 0$

150. If an experiment involves 2 or more treatements are fixed and the others are of random nature, one should choose :

(A) Mixed effect model

(B) Random effect model

(C) Component of variance model

(D) Anova model

151. The experiments in which the treatements are allocated to experimental units through a random pressure are categorised as :

(A) C. R. D.

(B) Partially R. B. D.

(C) R. B. D.

(D) L. S. D.

152. In the R.B. D. with 'b' block and 'v' treatments the error degrees of freedom are :

(A) $b(v-1)$

(B) $(b-1)(v-1)$

(C) $v(b-1)$

(D) (b^2-1)

153. In a Randomised block design with 4 blocks and 5 treatments having one missing value, the error degrees of freedom will be :

(A) 12

(B) 11

(C) 10

(D) 9

154. If a stratified sample of size 45 is to be selected by Neyman allocation population with $N_1 = 150$, $N_2 = 350$, $S_1^2 = 4$, $S_2^2 = 9$, then the number of units to be selected from the first stratum is :

(A) 10

(B) 75

(C) 35

(D) 20

155. Which one of the following refers to the deliberate introduction of non-orthogonality in a Design ?

(A) Confounding

(B) Randomisation

(C) Error Control

(D) Local Control

156. For a 2^3 factorial design with r replications, what is the error d. f. is :

(A) $6(r-1)$

(B) $7(r-1)$

(C) $7r$

(D) $8r$

157. In a design of experiment with 5 factors each considered at 2 levels, the key block is given as :

BC, DE, BCDE, ABD, ACD, ABE, ACE. Which one of the following gives confounded interaction ?

(A) ABC, ACE, BCDE

(B) ADE, ABCD, BCE

(C) ACE, ABD, BCDE

(D) ABC, ADE, DCBE

158. A factorial design in which both dependent variables involve random assignment is referred to as a _____ factorial design.

(A) Within subjects

(B) Mixed

(C) Correlated-groups

(D) Between subjects

159. Given N = 120 and n = 8. Which one among the following represents a balanced systematic sample :

(A) {3, 33, 63, 93, 28, 58, 88, 118}

(B) {7, 17, 27, 37, 47, 87, 97, 107}

(C) {3, 32, 62, 92, 25, 55, 85, 110}

(D) {5, 15, 25, 35, 45, 85, 95, 105}

160. Given that N = 500, n = 50, $\bar{x}$ = 125, $\bar{y}$ = 250, $\bar{X}$ = 150. Then the ratio estimator of $\bar{Y}$ is :

(A) 325

(B) 375

(C) 300

(D) 400

161. Which of the following principles of experimentation is / are used in the case of CRD ?

(A) Local control

(B) Randomisation and Local control

(C) Replication and Local control

(D) Replication and Randomisation

162. A population of size 100 is divided into 3 strata with sizes 50, 30 and 20 respectively with equal variance. What are the stratum sample sizes under proportional allocation for a fixed sample size 20 ?

(A) 4, 9 and 7

(B) 6, 9 and 15

(C) 10, 6 and 4

(D) 8, 7 and 5

163. In a 2^3-factorial experiment, principal blocks of replicates 1 and 2 respectively consists consist of {(1), A, B, C, ABC} and {ABC, AC, B, (1)}. What are the confounded interaction effects in the two replicates respectively ?

(A) ABC and AB

(B) BC and AB

(C) AB and BC

(D) BC and AC

164. In ANOVA for one way classified data with 3 classes and 3 observations per class, F value is 15 and total sum of squares is 12. What is the mean square between classes ?

(A) 2

(B) 3

(C) 4

(D) 5

165. If $\bar{y}$ is the mean of a simple random sample of size 'n' drawn from a population of size N, then what is the Ratio $\frac{V(\bar{y})SRSWOR}{V(\bar{y})SRSWR}$ equal to :

(A) $\frac{(N-1)}{(N-n)}$

(B) $\frac{(N-n)}{(N-1)}$

(C) $\frac{(N-n)}{Nn}$

(D) $\frac{(N-1)}{Nn}$

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